

WO 99/49735

PCT/US99/06644

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## SEQUENCE LISTING

<110> Fox Chase Cancer Center  
Kruh, Gary D.  
Lee, Kun  
Belinsky, Martin G.  
Bain, Lisa J.

<120> MRP-Related ABC Transporter Encoding  
Nucleic Acids and Methods of Use Thereof

<130> FCCC 98-02

<150> 60/079,759

<151> 1998-03-27

<150> 60/095,153

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35     40     45
Pro Glu Asp Arg Ser Gln His Leu Gly Glu Glu Leu Gln Gly Phe Trp
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Asp Lys Glu Val Leu Arg Ala Glu Asn Asp Ala Gln Lys Pro Ser Leu
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Thr Arg Ala Ile Ile Lys Cys Tyr Trp Lys Ser Tyr Leu Val Leu Gly
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| gggactcctc  | ccaactccagt | atccagaact  | cgcccaagct  | gacccccaaa  | atgaaaaaag  | 1680 |
| acaagagggc  | ttccaggggc  | aagaaagaga  | aggtgaggca  | gctgcagcgc  | actgagcatc  | 1740 |
| aggcgtgct   | ggcagagcag  | aaaggccacc  | tcttcttgga  | cagtgaacgag | cggcccagtc  | 1800 |
| ccgaagagga  | agaaggcaag  | cacatccacc  | tgggccacct  | gcgcttacag  | aggacactgc  | 1860 |
| acagcatcga  | tctggagatc  | caagagggtg  | aactggttgg  | aatctgcggc  | agtgtgggaa  | 1920 |
| gtggaaaaaac | ctctctcatt  | tcagccattt  | taggccagat  | gacgcttcta  | gagggcagca  | 1980 |
| ttgcaatcag  | tggaaccttc  | gcttatgtgg  | cccagcaggc  | ctggatcctc  | aatgctactc  | 2040 |
| tgagagacaa  | cctgaggcct  | gggaagggaat | atgatgaaga  | aagatacaac  | tctgtgctga  | 2100 |
| acagctgctg  | agccaacctg  | agcgggtggg  | agcgcacagc  | gatcagcctt  | gcccgggctt  | 2160 |
| gagagcagag  | caggagcatc  | tacatcctgg  | acgacccctt  | cagtgcctta  | gatgcccatt  | 2220 |
| tgtatagtga  | catcttcaat  | agtgcctatc  | ggaaacatct  | caagtccaag  | acagttctgt  | 2280 |
| tgggcaacca  | ccagttacag  | tacctggttg  | acctgtgatg  | agtgatcttc  | atgaaagagg  | 2340 |
| ttgttaccca  | ggaaagaggc  | acccatgagg  | aactgatgaa  | tttaaatggt  | gactatgcta  | 2400 |
| gctgtattac  | taacctgttg  | ctgggagaga  | caccgccagt  | tgagatcaat  | tcaaaaaagg  | 2460 |
| ccatttttaa  | ttcacagaag  | aagtcacaag  | acaagggtcc  | taaaacagga  | tcagtaaaga  | 2520 |
| aaaccagtgg  | agtaaaagcca | gaggaagggc  | agcttgtgca  | gctggaagag  | aaagggcagg  | 2580 |
| aggaaaaagc  | ctgggtcagta | tatgggtgct  | acatccagcg  | tgctgggggc  | cccttggcat  | 2640 |
| gttcagtgcc  | tatggccctt  | ttcatgctga  | atgtaggcag  | caccgccttc  | agcactgggt  | 2700 |
| tccctgggtat | ctggatcaag  | caaggaagcg  | ggaacaccac  | tgtgactcga  | gggaacgaga  | 2760 |
| ggttgagtta  | tgacagcatg  | aaggacaatc  | ctcatatgca  | gtactatgcc  | agcatctacg  | 2820 |
| cctcgggtgag |             |             |             |             |             | 2880 |

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|             |             |              |             |             |             |      |
|-------------|-------------|--------------|-------------|-------------|-------------|------|
| ccctctccat  | ggcagtcacg  | ctgatacctga  | aagccattcg  | aggagttgtc  | tttgtcaagg  | 2940 |
| gcacgctgcg  | agcttccctcc | cggtctgcacg  | acgagctttt  | ccgaaggatc  | cttcgaagcc  | 3000 |
| ctatgaagtt  | ttttgacacg  | acccccacag   | ggaggattct  | caacagggtt  | tccaaagaca  | 3060 |
| tggatgaagt  | tgacgtgcgg  | ctgccgttcc   | aggccgagat  | gttcatccag  | aacgttatcc  | 3120 |
| tgggtgttctt | ctgtgtggga  | atgategcag   | gagttctccc  | gtggttcctt  | gtggcagtg   | 3180 |
| ggcccccttgt | catectcttt  | tcagtcctgc   | acattgtctc  | cagggtcctg  | attcgggagc  | 3240 |
| tgaagcgtct  | ggacaatatc  | acgcagtcac   | ctttcctctc  | ccacatcacg  | tccagcatac  | 3300 |
| agggccttgc  | caccatccac  | gcctacaata   | aagggcagga  | gtttctgcac  | agataccagg  | 3360 |
| agctgctgga  | tgacaacca   | gctccttttt   | ttttgtttac  | gtgtgcgatg  | cgggtggctgg | 3420 |
| ctgtgcggct  | ggacctcatc  | agcatcgccc   | tcataccac   | cacggggctg  | atgategttc  | 3480 |
| ttatgcacgg  | gcagattccc  | ccagcctatg   | cgggtctcgc  | catctcttat  | gctgtccagt  | 3540 |
| taacggggct  | gttccagttt  | acggtcagac   | tggcatctga  | gacagaagct  | cgattcacct  | 3600 |
| cgggtggagag | gatcaatcac  | tacattaaga   | ctctgtcctt  | ggaagcacct  | gccagaatta  | 3660 |
| agaacaaggc  | tccctcccc   | gactggcccc   | aggagggaga  | ggtgaccttt  | gagaacgcag  | 3720 |
| agatgaggta  | ccgagaaaac  | ctcctctctg   | tcctaaagaa  | agtatccttc  | acgatcaaac  | 3780 |
| ctaaagagaa  | gattggcatt  | gtggggcgga   | caggatcagg  | gaagtctctg  | ctggggatgg  | 3840 |
| ccctcttccg  | tctgggtggag | ttatctggag   | gctgcacaa   | gattgatgga  | gtgagaatca  | 3900 |
| gtgatattgg  | ccttgccgac  | ctccgaagca   | aactctctat  | cattcctcaa  | gagccgggtgc | 3960 |
| gtttcagttg  | cactgtcaga  | tcaaatttgg   | accccttcaa  | ccagtacact  | gaagaccaga  | 4020 |
| tttgggatgc  | cctggagagg  | acacacatga   | aagaatgtat  | tgctcagcta  | cctctgaaac  | 4080 |
| ttgaatctga  | agtgatggag  | aatggggata   | acttctcagt  | gggggaacgg  | cagctcttgt  | 4140 |
| gcatagctag  | agccctgctc  | cggcactgta   | agattctgat  | tttagatgaa  | gccacagctg  | 4200 |
| ccatggacac  | agagacagac  | ttattgattc   | aagagaccat  | ccgagaagca  | tttgagact   | 4260 |
| gtaccatgct  | caccattgcc  | catcgctgtg   | acacggttct  | aggctccgat  | aggattatgg  | 4320 |
| tgctggccca  | gggacaggtg  | gtggagtgtg   | acacccctac  | ggctctctctg | tccaacgaca  | 4380 |
| gttcccgatt  | ctatgccatg  | tttgcgtctg   | cagagaacaa  | ggctcgtctg  | aagggtctgac | 4440 |
| tcctccctgt  | tgacgaagtc  | tcttttcttt   | agagcattgc  | cattccctgc  | ctggggcggg  | 4500 |
| ccctcatcg   | cgtctctcta  | ccgaaacctt   | gcctttctctg | atatttatctt | tgcacagca   | 4560 |
| gttccggatt  | ggcttgtgtg  | tttcaatttt   | aggagagtc   | atattttgat  | tattgtattt  | 4620 |
| attccatatt  | catgtaaa    | aaattttagt   | tttgttctta  | attgcactct  | aaaagggtca  | 4680 |
| gggaaccgtt  | attataattg  | tatcagaggg   | ctataatgaa  | gctttatacg  | tgtagctata  | 4740 |
| tctatatata  | attctgtaca  | tagcctatat   | ttacagtga   | aatgtaagct  | gtttatttta  | 4800 |
| tattaaaata  | agcactgtgc  | taataaacagt  | gcatattcct  | ttctatcatt  | tttgtacagt  | 4860 |
| ttgctgtact  | agagatctgg  | ttttgctatt   | agactgtagg  | aagagttagca | tttcattctt  | 4920 |
| ctctagctgg  | tggtttcacg  | gtgccaggtt   | ttctgggtgt  | ccaaaggaag  | acgtgtggca  | 4980 |
| atagtgggccc | ctccgacagc  | ccctctctgccc | gcctccccac  | agccgctcca  | gggggtggctg | 5040 |
| gagacgggtg  | ggcggctgga  | gaccatgcag   | agcgcctgta  | gttctcaggg  | ctcctgcctt  | 5100 |
| ctgtcctgg   | gtcacttact  | gtttctgtca   | ggagagcagc  | ggggcggaagc | ccaggccctt  | 5160 |
| tttcaactccc | tccatcaaga  | atggggatca   | cagagacatt  | cctccgagcc  | ggggagtttc  | 5220 |
| tttctctgct  | tcttcttttt  | gctgtttgtt   | ctaaacaaga  | atcagtctat  | ccacagagag  | 5280 |
| tcccactgcc  | tcaggttcct  | atggctggcc   | actgcacaga  | gctctccagc  | tccaagacct  | 5340 |
| gttggttcca  | agccctggag  | ccaactgctg   | ctttttgagg  | tggcactttt  | tcatttgctt  | 5400 |
| attccacac   | ctccacagtt  | cagtggcagg   | gctcaggatt  | tcgtgggtct  | gttttctctt  | 5460 |
| ctcaccgcag  | tcgtgcgaca  | gtctctctct   | ctctctcccc  | tcaaagtctg  | caactttaag  | 5520 |
| cagctcttgc  | taatcagttg  | ctcacactgg   | cgtagaagtt  | tttgtactgt  | aaagagacct  | 5580 |
| acctcaggtt  | gctgggttgc  | gtgtggtttg   | gtgtgttccc  | gcaaaccccc  | tttgtgtgtg  | 5640 |
| ggggctggta  | gctcaggtgg  | gcgtggctac   | tgctgtcatc  | agttgaatgg  | tcagcgttgc  | 5700 |
| atgtcgtgac  | caactagaca  | ttctgtcgcc   | ttagcatgtt  | tgctgaacac  | cttgtggaag  | 5760 |
| caaaaatctg  | aaaatgtgaa  | taaaattatt   | ttggattttg  | taaaaaaaaa  | aaaaaaaaaa  | 5820 |
| aaaaaaaaaa  | aaaaaaaaaa  |              |             |             |             | 5838 |

&lt;210&gt; 4

&lt;211&gt; 1437

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 4

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Lys | Asp | Ile | Asp | Ile | Gly | Lys | Glu | Tyr | Ile | Ile | Pro | Ser | Pro | Gly |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Tyr | Arg | Ser | Val | Arg | Glu | Arg | Thr | Ser | Thr | Ser | Gly | Thr | His | Arg | Asp |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Arg | Glu | Asp | Ser | Lys | Phe | Arg | Arg | Thr | Arg | Pro | Leu | Glu | Cys | Gln | Asp |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Ala | Leu | Glu | Thr | Ala | Ala | Arg | Ala | Glu | Gly | Leu | Ser | Leu | Asp | Ala | Ser |

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50 55 60  
 Met His Ser Gln Leu Arg Ile Leu Asp Glu Glu His Pro Lys Gly Lys  
 65 70 75 80  
 Tyr His His Gly Leu Ser Ala Leu Lys Pro Ile Arg Thr Thr Ser Lys  
 85 90 95  
 His Gln His Pro Val Asp Asn Ala Gly Leu Phe Ser Cys Met Thr Phe  
 100 105 110  
 Ser Trp Leu Ser Ser Leu Ala Arg Val Ala His Lys Lys Gly Glu Leu  
 115 120 125  
 Ser Met Glu Asp Val Trp Ser Leu Ser Lys His Glu Ser Ser Asp Val  
 130 135 140  
 Asn Cys Arg Arg Leu Glu Arg Leu Trp Gln Glu Glu Leu Asn Glu Val  
 145 150 155 160  
 Gly Pro Asp Ala Ala Ser Leu Arg Arg Val Val Trp Ile Phe Cys Arg  
 165 170 175  
 Thr Arg Leu Ile Leu Ser Ile Val Cys Leu Met Ile Thr Gln Leu Ala  
 180 185 190  
 Gly Phe Ser Gly Pro Ala Phe Met Val Lys His Leu Leu Glu Tyr Thr  
 195 200 205  
 Gln Ala Thr Glu Ser Asn Leu Gln Tyr Ser Leu Leu Leu Val Leu Gly  
 210 215 220  
 Leu Leu Leu Thr Glu Ile Val Arg Ser Trp Ser Leu Ala Leu Thr Trp  
 225 230 235 240  
 Ala Leu Asn Tyr Arg Thr Gly Val Arg Leu Arg Gly Ala Ile Leu Thr  
 245 250 255  
 Met Ala Phe Lys Lys Ile Leu Lys Leu Lys Asn Ile Lys Glu Lys Ser  
 260 265 270  
 Leu Gly Glu Leu Ile Asn Ile Cys Ser Asn Asp Gly Gln Arg Met Phe  
 275 280 285  
 Glu Ala Ala Ala Val Gly Ser Leu Leu Ala Gly Gly Pro Val Val Ala  
 290 295 300  
 Ile Leu Gly Met Ile Tyr Asn Val Ile Ile Leu Gly Pro Thr Gly Phe  
 305 310 315 320  
 Leu Gly Ser Ala Val Phe Ile Leu Phe Tyr Pro Ala Met Met Phe Ala  
 325 330 335  
 Ser Arg Leu Thr Ala Tyr Phe Arg Arg Lys Cys Val Ala Ala Thr Asp  
 340 345 350  
 Glu Arg Val Gln Lys Met Asn Glu Val Leu Thr Tyr Ile Lys Phe Ile  
 355 360 365  
 Lys Met Tyr Ala Trp Val Lys Ala Phe Ser Gln Ser Val Gln Lys Ile  
 370 375 380  
 Arg Glu Glu Glu Arg Arg Ile Leu Glu Lys Ala Gly Tyr Phe Gln Gly  
 385 390 395 400  
 Ile Thr Val Gly Val Ala Pro Ile Val Val Val Ile Ala Ser Val Val  
 405 410 415  
 Thr Phe Ser Val His Met Thr Leu Gly Phe Asp Leu Thr Ala Ala Gln  
 420 425 430  
 Ala Phe Thr Val Val Thr Val Phe Asn Ser Met Thr Phe Ala Leu Lys  
 435 440 445  
 Val Thr Pro Phe Ser Val Lys Ser Leu Ser Glu Ala Ser Val Ala Val  
 450 455 460  
 Asp Arg Phe Lys Ser Leu Phe Leu Met Glu Glu Val His Met Ile Lys  
 465 470 475 480  
 Asn Lys Pro Ala Ser Pro His Ile Lys Ile Glu Met Lys Asn Ala Thr  
 485 490 495  
 Leu Ala Trp Asp Ser Ser His Ser Ser Ile Gln Asn Ser Pro Lys Leu  
 500 505 510  
 Thr Pro Lys Met Lys Lys Asp Lys Arg Ala Ser Arg Gly Lys Lys Glu  
 515 520 525  
 Lys Val Arg Gln Leu Gln Arg Thr Glu His Gln Ala Val Leu Ala Glu  
 530 535 540  
 Gln Lys Gly His Leu Leu Leu Asp Ser Asp Glu Arg Pro Ser Pro Glu  
 545 550 555 560  
 Glu Glu Glu Gly Lys His Ile His Leu Gly His Leu Arg Leu Gln Arg  
 565 570 575  
 Thr Leu His Ser Ile Asp Leu Glu Ile Gln Glu Gly Lys Leu Val Gly

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580 585 590  
 Ile Cys Gly Ser Val Gly Ser Gly Lys Thr Ser Leu Ile Ser Ala Ile  
 595 600 605  
 Leu Gly Gln Met Thr Leu Leu Glu Gly Ser Ile Ala Ile Ser Gly Thr  
 610 615 620  
 Phe Ala Tyr Val Ala Gln Gln Ala Trp Ile Leu Asn Ala Thr Leu Arg  
 625 630 635 640  
 Asp Asn Ile Leu Phe Gly Lys Glu Tyr Asp Glu Glu Arg Tyr Asn Ser  
 645 650 655  
 Val Leu Asn Ser Cys Cys Leu Arg Pro Asp Leu Ala Ile Leu Pro Ser  
 660 665 670  
 Ser Asp Leu Thr Glu Ile Gly Glu Arg Gly Ala Asn Leu Ser Gly Gly  
 675 680 685  
 Gln Arg Gln Arg Ile Ser Leu Ala Arg Ala Leu Tyr Ser Asp Arg Ser  
 690 695 700  
 Ile Tyr Ile Leu Asp Asp Pro Leu Ser Ala Leu Asp Ala His Val Gly  
 705 710 715 720  
 Asn His Ile Phe Asn Ser Ala Ile Arg Lys His Leu Lys Ser Lys Thr  
 725 730 735  
 Val Leu Phe Val Thr His Gln Leu Gln Tyr Leu Val Asp Cys Asp Glu  
 740 745 750  
 Val Ile Phe Met Lys Glu Gly Cys Ile Thr Glu Arg Gly Thr His Glu  
 755 760 765  
 Glu Leu Met Asn Leu Asn Gly Asp Tyr Ala Thr Ile Phe Asn Asn Leu  
 770 775 780  
 Leu Leu Gly Glu Thr Pro Pro Val Glu Ile Asn Ser Lys Lys Glu Thr  
 785 790 795 800  
 Ser Gly Ser Gln Lys Lys Ser Gln Asp Lys Gly Pro Lys Thr Gly Ser  
 805 810 815  
 Val Lys Lys Glu Lys Ala Val Lys Pro Glu Glu Gly Gln Leu Val Gln  
 820 825 830  
 Leu Glu Glu Lys Gly Gln Gly Ser Val Pro Trp Ser Val Tyr Gly Val  
 835 840 845  
 Tyr Ile Gln Ala Ala Gly Gly Pro Leu Ala Phe Leu Val Ile Met Ala  
 850 855 860  
 Leu Phe Met Leu Asn Val Gly Ser Thr Ala Phe Ser Thr Trp Trp Leu  
 865 870 875 880  
 Ser Tyr Trp Ile Lys Gln Gly Ser Gly Asn Thr Thr Val Thr Arg Gly  
 885 890 895  
 Asn Glu Thr Ser Val Ser Asp Ser Met Lys Asp Asn Pro His Met Gln  
 900 905 910  
 Tyr Tyr Ala Ser Ile Tyr Ala Leu Ser Met Ala Val Met Leu Ile Leu  
 915 920 925  
 Lys Ala Ile Arg Gly Val Val Phe Val Lys Gly Thr Leu Arg Ala Ser  
 930 935 940  
 Ser Arg Leu His Asp Glu Leu Phe Arg Arg Ile Leu Arg Ser Pro Met  
 945 950 955 960  
 Lys Phe Phe Asp Thr Pro Thr Gly Arg Ile Leu Asn Arg Phe Ser  
 965 970 975  
 Lys Asp Met Asp Glu Val Asp Val Arg Leu Pro Phe Gln Ala Glu Met  
 980 985 990  
 Phe Ile Gln Asn Val Ile Leu Val Phe Phe Cys Val Gly Met Ile Ala  
 995 1000 1005  
 Gly Val Phe Pro Trp Phe Leu Val Ala Val Gly Pro Leu Val Ile Leu  
 1010 1015 1020  
 Phe Ser Val Leu His Ile Val Ser Arg Val Leu Ile Arg Glu Leu Lys  
 1025 1030 1035 1040  
 Arg Leu Asp Asn Ile Thr Gln Ser Pro Phe Leu Ser His Ile Thr Ser  
 1045 1050 1055  
 Ser Ile Gln Gly Leu Ala Thr Ile His Ala Tyr Asn Lys Gly Gln Glu  
 1060 1065 1070  
 Phe Leu His Arg Tyr Gln Glu Leu Leu Asp Asp Asn Gln Ala Pro Phe  
 1075 1080 1085  
 Phe Leu Phe Thr Cys Ala Met Arg Trp Leu Ala Val Arg Leu Asp Leu  
 1090 1095 1100  
 Ile Ser Ile Ala Leu Ile Thr Thr Thr Gly Leu Met Ile Val Leu Met



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1105 His Gly Gln Ile Pro Pro Ala Tyr Ala Gly Leu Ala Ile Ser Tyr Ala 1110 1115 1120  
 1125 Val Gln Leu Thr Gly Leu Phe Gln Phe Thr Val Arg Leu Ala Ser Glu 1130 1135  
 1140 Thr Glu Ala Arg Phe Thr Ser Val Glu Arg Ile Asn His Tyr Ile Lys 1145 1150  
 1155 Thr Leu Ser Leu Glu Ala Pro Ala Arg Ile Lys Asn Lys Ala Pro Ser 1160 1165  
 1170 Pro Asp Trp Pro Gln Glu Gly Glu Val Thr Phe Glu Asn Ala Glu Met 1175 1180  
 1185 Arg Tyr Arg Glu Asn Leu Pro Leu Val Leu Lys Lys Val Ser Phe Thr 1190 1195 1200  
 1205 Ile Lys Pro Lys Glu Lys Ile Gly Ile Val Gly Arg Thr Gly Ser Gly 1210 1215  
 1220 Lys Ser Ser Leu Gly Met Ala Leu Phe Arg Leu Val Glu Leu Ser Gly 1225 1230  
 1235 Gly Cys Ile Lys Ile Asp Gly Val Arg Ile Ser Asp Ile Gly Leu Ala 1240 1245  
 1250 Asp Leu Arg Ser Lys Leu Ser Ile Ile Pro Gln Glu Pro Val Leu Phe 1255 1260  
 1265 Ser Gly Thr Val Arg Ser Asn Leu Asp Pro Phe Asn Gln Tyr Thr Glu 1270 1275 1280  
 1285 Asp Gln Ile Trp Asp Ala Leu Glu Arg Thr His Met Lys Glu Cys Ile 1290 1295  
 1300 Ala Gln Leu Pro Leu Lys Leu Glu Ser Glu Val Met Glu Asn Gly Asp 1305 1310  
 1315 Asn Phe Ser Val Gly Glu Arg Gln Leu Leu Cys Ile Ala Arg Ala Leu 1320 1325  
 1330 Leu Arg His Cys Lys Ile Leu Ile Leu Asp Glu Ala Thr Ala Ala Met 1335 1340  
 1345 Asp Thr Glu Thr Asp Leu Leu Ile Gln Glu Thr Ile Arg Glu Ala Phe 1350 1355 1360  
 1365 Ala Asp Cys Thr Met Leu Thr Ile Ala His Arg Leu His Thr Val Leu 1370 1375  
 1380 Gly Ser Asp Arg Ile Met Val Leu Ala Gln Gly Gln Val Val Glu Phe 1385 1390  
 1395 Asp Thr Pro Ser Val Leu Leu Ser Asn Asp Ser Ser Arg Phe Tyr Ala 1400 1405  
 1410 Met Phe Ala Ala Ala Glu Asn Lys Val Ala Val Lys Gly 1415 1420  
 1425 1430 1435

&lt;210&gt; 5

&lt;211&gt; 5079

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 5

|             |            |            |             |             |            |      |
|-------------|------------|------------|-------------|-------------|------------|------|
| ccccatggac  | gcctgtgctg | gttcggggga | gctcggtctcc | aagttctggg  | actccaacct | 60   |
| gtctgtgcac  | acagaaaacc | cggacctcac | tccctgcttc  | cagaactccc  | tgctggcctg | 120  |
| ggtgccctgc  | atctacctgt | gggtcgccct | gccctgctac  | ttgctctacc  | tgccgcacca | 180  |
| ttgtctgggc  | tacatcatcc | ttcccacct  | gtccaagctc  | aagatgggtcc | tgggtgtcct | 240  |
| gctgtgggtgc | gtctcctggg | cggacctttt | ttactccttc  | catggcctgg  | tccatggccg | 300  |
| ggccccctgcc | cctgttttct | ttgtcaccct | cttgggtggtg | ggggtcacca  | tgctgctggc | 360  |
| caccctgctg  | atacagtatg | agcggtgca  | ggcgctacag  | tcttcggggg  | tctcattat  | 420  |
| cttctgggtc  | ctgtgtgtgg | tctgcgccat | cgtcccatte  | cgtccaaga   | tccttttagc | 480  |
| caaggcagag  | ggtgagatct | cagacctctt | ccgcttcacc  | accttctaca  | tccactttgc | 540  |
| cctggtactc  | tctgccttca | tcttgacctg | cttcagggag  | aaacctccat  | ttttctccgc | 600  |
| aaagaatgtc  | gaccttaacc | cctacctga  | gaccagcgct  | ggctttctct  | cccgctgtt  | 660  |
| tttctgggtg  | ttcacaaga  | tggccatcta | tggtaccgg   | catccccctg  | aggagaagga | 720  |
| cctctgggtcc | ctaaaggaag | aggacagatc | ccagatggtg  | gtgcagcagc  | tgctggaggc | 780  |
| atggaggaag  | caggaaaagc | agacggcacg | acacaaggct  | tcagcagcac  | ctgggaaaaa | 840  |
| tgccctccggc | gaggacgagg | tgctgctggg | tgccccggcc  | aggccccgga  | agccctcctt | 900  |
| cctgaaggcc  | ctgctggcca | ccttcggctc | cagcttcctc  | atcagtgcct  | gcttcaagct | 960  |
| tatccaggac  | ctgctctcct | tcatcaatcc | acagctgctc  | agcatcctga  | tcaggtttat | 1020 |
| ctccaacccc  | atggccccct | cctggtgggg | cttctggtg   | gctgggctga  | tgttcctgtg | 1080 |

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|             |             |             |             |             |             |      |
|-------------|-------------|-------------|-------------|-------------|-------------|------|
| ctccatgatg  | cagtegetga  | tcttacaaca  | ctattaccac  | tacatctttg  | tgactggggt  | 1140 |
| gaagtttcgt  | actgggatca  | tgggtgtcat  | ctacaggaag  | gctctgggta  | tcaccaactc  | 1200 |
| agtcaaacgt  | gcgtccactg  | tgggggaaat  | tgtcaacctc  | atgtcagtg   | atgccccagcg | 1260 |
| cttcatggac  | cttggccccc  | tcttcaatct  | gctgtgggtc  | gcacccctgc  | agatcatcct  | 1320 |
| ggcgatctac  | ttcctctggc  | agaacctagg  | tccctctgtc  | ctggctggag  | tcgctttcat  | 1380 |
| ggtccttgctg | attccactca  | acggagctgt  | ggccgtgaag  | atgcgcgcct  | tccaggtaaa  | 1440 |
| gcaaataaaa  | ttgaaggact  | cgcgcaccaa  | gctgatgagt  | gagatcctga  | acggcatcaa  | 1500 |
| ggtgctgaag  | ctgtacgcct  | gggagcccg   | cttccctgaag | caggtggagg  | gcacaggca   | 1560 |
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| cctgccccccc | actctgcaca  | gcctagacat  | ccaggtcccgc | aaaggggcac  | tggtggccgt  | 1980 |
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5079

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 Gln Asn Ser Leu Leu Ala Trp Val Pro Cys Ile Tyr Leu Trp Val Ala  
 35 40 45  
 Leu Pro Cys Tyr Leu Leu Tyr Leu Arg His His Cys Arg Gly Tyr Ile  
 50 55 60  
 Ile Leu Ser His Leu Ser Lys Leu Lys Met Val Leu Gly Val Leu Leu  
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 Trp Cys Val Ser Trp Ala Asp Leu Phe Tyr Ser Phe His Gly Leu Val  
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 His Gly Arg Ala Pro Ala Pro Val Phe Phe Val Thr Pro Leu Val Val  
 100 105 110  
 Gly Val Thr Met Leu Leu Ala Thr Leu Leu Ile Gln Tyr Glu Arg Leu  
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 Gln Gly Val Gln Ser Ser Gly Val Leu Ile Ile Phe Trp Phe Leu Cys  
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 Lys Pro Pro Phe Phe Ser Ala Lys Asn Val Asp Pro Asn Pro Tyr Pro  
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 Glu Thr Ser Val Gly Phe Leu Ser Arg Leu Phe Phe Trp Trp Phe Thr  
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 Lys Met Ala Ile Tyr Gly Tyr Arg His Pro Leu Glu Lys Asp Leu  
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 Leu Glu Ala Trp Arg Lys Gln Glu Lys Gln Thr Ala Arg His Lys Ala  
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 Ser Ala Ala Pro Gly Lys Asn Ala Ser Gly Glu Asp Glu Val Leu Leu  
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 Gly Ala Arg Pro Arg Pro Arg Lys Pro Ser Phe Leu Lys Ala Leu Leu  
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 Ala Thr Phe Gly Ser Ser Phe Leu Ile Ser Ala Cys Phe Lys Leu Ile  
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 325 330 335  
 Arg Phe Ile Ser Asn Pro Met Ala Pro Ser Trp Trp Gly Phe Leu Val  
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 Ala Gly Leu Met Phe Leu Cys Ser Met Met Gln Ser Leu Ile Leu Gln  
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 His Tyr Tyr His Tyr Ile Phe Val Thr Gly Val Lys Phe Arg Thr Gly  
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 Ile Met Gly Val Ile Tyr Arg Lys Ala Leu Val Ile Thr Asn Ser Val  
 385 390 395 400  
 Lys Arg Ala Ser Thr Val Gly Glu Ile Val Asn Leu Met Ser Val Asp  
 405 410 415  
 Ala Gln Arg Phe Met Asp Leu Ala Pro Phe Leu Asn Leu Leu Trp Ser  
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|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Pro | Ser | Val | Leu | Ala | Gly | Val | Ala | Phe | Met | Val | Leu | Leu | Ile | Pro |
| 450 |     |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |
| Leu | Asn | Gly | Ala | Val | Ala | Val | Lys | Met | Arg | Ala | Phe | Gln | Val | Lys | Gln |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Met | Lys | Leu | Lys | Asp | Ser | Arg | Ile | Lys | Leu | Met | Ser | Glu | Ile | Leu | Asn |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Gly | Ile | Lys | Val | Leu | Lys | Leu | Tyr | Ala | Trp | Glu | Pro | Ser | Phe | Leu | Lys |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Gln | Val | Glu | Gly | Ile | Arg | Gln | Gly | Glu | Leu | Gln | Leu | Leu | Arg | Thr | Ala |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     |     | 525 |     |     |
| Ala | Tyr | Leu | His | Thr | Thr | Thr | Thr | Phe | Thr | Trp | Met | Cys | Ser | Pro | Phe |
| 530 |     |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Leu | Val | Thr | Leu | Ile | Thr | Leu | Trp | Val | Tyr | Val | Tyr | Val | Asp | Pro | Asn |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Asn | Val | Leu | Asp | Ala | Glu | Lys | Ala | Phe | Val | Ser | Val | Ser | Leu | Phe | Asn |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Ile | Leu | Arg | Leu | Pro | Leu | Asn | Met | Leu | Pro | Gln | Leu | Ile | Ser | Asn | Leu |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |
| Thr | Gln | Ala | Ser | Val | Ser | Leu | Lys | Arg | Ile | Gln | Gln | Phe | Leu | Ser | Gln |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |
| Glu | Glu | Leu | Asp | Pro | Gln | Ser | Val | Glu | Arg | Lys | Thr | Ile | Ser | Pro | Gly |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |
| Tyr | Ala | Ile | Thr | Ile | His | Ser | Gly | Thr | Phe | Thr | Trp | Ala | Gln | Asp | Leu |
| 625 |     |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |
| Pro | Pro | Thr | Leu | His | Ser | Leu | Asp | Ile | Gln | Val | Pro | Lys | Gly | Ala | Leu |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |
| Val | Ala | Val | Val | Gly | Pro | Val | Gly | Cys | Gly | Lys | Ser | Ser | Leu | Val | Ser |
|     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |
| Ala | Leu | Leu | Gly | Glu | Met | Glu | Lys | Leu | Glu | Gly | Lys | Val | His | Met | Lys |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |
| Gly | Ser | Val | Ala | Tyr | Val | Pro | Gln | Gln | Ala | Trp | Ile | Gln | Asn | Cys | Thr |
| 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |     |
| Leu | Gln | Glu | Asn | Val | Leu | Phe | Gly | Lys | Ala | Leu | Asn | Pro | Lys | Arg | Tyr |
| 705 |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     | 720 |
| Gln | Gln | Thr | Leu | Glu | Ala | Cys | Ala | Leu | Leu | Ala | Asp | Leu | Glu | Met | Leu |
|     |     |     |     | 725 |     |     |     |     | 730 |     |     |     |     | 735 |     |
| Pro | Gly | Gly | Asp | Gln | Thr | Glu | Ile | Gly | Glu | Lys | Gly | Ile | Asn | Leu | Ser |
|     |     |     | 740 |     |     |     |     | 745 |     |     |     |     | 750 |     |     |
| Gly | Gly | Gln | Arg | Gln | Arg | Val | Ser | Leu | Ala | Arg | Ala | Val | Tyr | Ser | Asp |
|     |     | 755 |     |     |     |     | 760 |     |     |     |     | 765 |     |     |     |
| Ala | Asp | Ile | Phe | Leu | Leu | Asp | Asp | Pro | Leu | Ser | Ala | Val | Asp | Ser | His |
| 770 |     |     |     |     |     | 775 |     |     |     |     | 780 |     |     |     |     |
| Val | Ala | Lys | His | Ile | Phe | Asp | His | Val | Ile | Gly | Pro | Glu | Gly | Val | Leu |
| 785 |     |     |     |     | 790 |     |     |     |     | 795 |     |     |     |     | 800 |
| Ala | Gly | Lys | Thr | Arg | Val | Leu | Val | Thr | His | Gly | Ile | Ser | Phe | Leu | Pro |
|     |     |     |     | 805 |     |     |     |     | 810 |     |     |     |     | 815 |     |
| Gln | Thr | Asp | Phe | Ile | Ile | Val | Leu | Ala | Asp | Gly | Gln | Val | Ser | Glu | Met |
|     |     |     | 820 |     |     |     |     | 825 |     |     |     |     | 830 |     |     |
| Gly | Pro | Tyr | Pro | Ala | Leu | Leu | Gln | Arg | Asn | Gly | Ser | Phe | Ala | Asn | Phe |
|     |     | 835 |     |     |     |     | 840 |     |     |     |     | 845 |     |     |     |
| Leu | Cys | Asn | Tyr | Ala | Pro | Asp | Glu | Asp | Gln | Gly | His | Leu | Glu | Asp | Ser |
|     |     | 850 |     |     |     | 855 |     |     |     |     | 860 |     |     |     |     |
| Trp | Thr | Ala | Leu | Glu | Gly | Ala | Glu | Asp | Lys | Glu | Ala | Leu | Leu | Ile | Glu |
| 865 |     |     |     |     | 870 |     |     |     |     | 875 |     |     |     |     | 880 |
| Asp | Thr | Leu | Ser | Asn | His | Thr | Asp | Leu | Thr | Asp | Asn | Asp | Pro | Val | Thr |
|     |     |     |     | 885 |     |     |     |     | 890 |     |     |     |     | 895 |     |
| Tyr | Val | Val | Gln | Lys | Gln | Phe | Met | Arg | Gln | Leu | Ser | Ala | Leu | Ser | Ser |
|     |     |     | 900 |     |     |     |     | 905 |     |     |     |     | 910 |     |     |
| Asp | Gly | Glu | Gly | Gln | Gly | Arg | Pro | Val | Pro | Arg | Arg | His | Leu | Gly | Pro |
|     |     | 915 |     |     |     |     | 920 |     |     |     |     | 925 |     |     |     |
| Ser | Glu | Lys | Val | Gln | Val | Thr | Glu | Ala | Lys | Ala | Asp | Gly | Ala | Leu | Thr |
|     |     | 930 |     |     |     | 935 |     |     |     |     | 940 |     |     |     |     |
| Gln | Glu | Glu | Lys | Ala | Ala | Ile | Gly | Thr | Val | Glu | Leu | Ser | Val | Phe | Trp |
| 945 |     |     |     |     | 950 |     |     |     |     | 955 |     |     |     |     | 960 |
| Asp | Tyr | Ala | Lys | Ala | Val | Gly | Leu | Cys | Thr | Thr | Leu | Ala | Ile | Cys | Leu |
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 Lys Arg Leu Glu Ser Val Ser Arg Ser Pro Ile Tyr Ser His Phe Ser  
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 Lys Thr Glu Thr Glu Ala Pro Trp Val Val Glu Gly Ser Arg Pro Pro  
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 Arg Tyr Arg Pro Gly Leu Asp Leu Val Leu Arg Asp Leu Ser Leu His  
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 Asp Tyr Thr Arg Val Leu Val Leu Asp Lys Gly Val Val Ala Glu Phe  
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| gtcctgtgta  | cctccagcgt  | ggctgtcgtc  | ctttggaaaa  | tccaacaggg  | aacgcctgag  | 300  |
| gccccagaat  | tcttcattca  | tctactgtg   | tggtcacca   | cgatgagctt  | cgcagtgttc  | 360  |
| ctgattcaca  | ccgagaggaa  | aaagggagtc  | cagtcactctg | gagtgtctgt  | tggttaactgg | 420  |
| cttctctgct  | ttgtcttgcc  | agctaccaac  | gctgcccagc  | aggcctccgg  | agcgggcttc  | 480  |
| cagagcgacc  | ctgtccgcca  | cctgtccacc  | tacctatgcc  | tgtctctggt  | ggtggcacag  | 540  |
| tttgtgctgt  | cctgcctggc  | ggatcaaccc  | cccttcttcc  | ctgaagaccc  | ccagcagctc  | 600  |
| aaccctgtgc  | cagagactgg  | ggcagccttc  | ccctccaaag  | ccacgttctg  | gtgggtttct  | 660  |
| ggcctgggtc  | ggaggggata  | caggaggcca  | ctgagaccaa  | aagacctctg  | gtcgtctggg  | 720  |
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| agaaaggcca  | gtgcgggtggg | tgatgtgggtc | aatctgggtg  | cctgtggacgt | gcagcggctg  | 1260 |
| accgagagcg  | ttctctacct  | caacgggctg  | tggtgtccctc | tcgtctggat  | cgtgggtctgc | 1320 |
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| atcaagtctc  | atggctggga  | gggagccttt  | ctggacagag  | tcctgggcat  | ccgaggccag  | 1560 |
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| gctatgaatg  | cagagaaagc  | ctttgtgact  | ctcacagttc  | tcaacatcct  | caacaaggcc  | 1740 |
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| ctgggtcacct | tctctgctc   | ggaagaagtt  | gacctgtgtg  | tcgtagactc  | aagttctctc  | 1860 |
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| gaaagccctc  | cctgcctcca  | cagaataaac  | cagacgggtg  | cccagggtctg | tctgtctggt  | 1980 |
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| gccgtgggca  | ccccctctg   | cctctacgca  | ctctctctct  | tctctgcca   | gcaagtggcc  | 2880 |
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| gcagtggcta  | ccccactggc  | cactgtggcc  | atcctgccac  | tgtttctctc  | ctacgtctggg | 3300 |

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|            |             |            |             |            |            |      |
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| tcgtctgtct | gctcccatat  | ggctgagacg | ttccagggca  | gcacagtggg | ccgggcattc | 3420 |
| cgaaccacag | ccccctttgt  | ggctcagaac | aatgctcgcg  | tagatgaaag | ccagaggatc | 3480 |
| agtttcccg  | gactggtggc  | tgacagggtg | cttgcgccca  | atgtggagct | cctggggaat | 3540 |
| ggcctggtgt | ttgcagccgc  | cacgtgtgct | gtgctgagca  | aagcccacct | cagtgtgggc | 3600 |
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| cgctccgtga | tggactgtgc  | ccgggttctg | gtcatggaca  | aggggcaggt | ggcagagagc | 4440 |
| ggcagcccgg | cccagctgct  | ggcccagaag | ggcctgtttt  | acagactggc | ccaggagtca | 4500 |
| ggcctggtc  |             |            |             |            |            | 4509 |

&lt;210&gt; 8

&lt;211&gt; 1503

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 8

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Ala | Pro | Ala | Glu | Pro | Cys | Ala | Gly | Gln | Gly | Val | Trp | Asn | Gln |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Thr | Glu | Pro | Glu | Pro | Ala | Ala | Thr | Ser | Leu | Leu | Ser | Leu | Cys | Phe | Leu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Arg | Thr | Ala | Gly | Val | Trp | Val | Pro | Met | Tyr | Leu | Trp | Val | Leu | Gly |     |
|     |     | 35  |     |     |     |     | 40  |     |     |     | 45  |     |     |     |     |
| Pro | Ile | Tyr | Leu | Leu | Phe | Ile | His | His | His | Gly | Arg | Gly | Tyr | Leu | Arg |
|     | 50  |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |
| Met | Ser | Pro | Leu | Phe | Lys | Ala | Lys | Met | Val | Leu | Gly | Phe | Ala | Leu | Ile |
| 65  |     |     |     |     | 70  |     |     |     | 75  |     |     |     |     | 80  |     |
| Val | Leu | Cys | Thr | Ser | Ser | Val | Ala | Val | Ala | Leu | Trp | Lys | Ile | Gln | Gln |
|     |     |     | 85  |     |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Gly | Thr | Pro | Glu | Ala | Pro | Glu | Phe | Leu | Ile | His | Pro | Thr | Val | Trp | Leu |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Thr | Thr | Met | Ser | Phe | Ala | Val | Phe | Leu | Ile | His | Thr | Glu | Arg | Lys | Lys |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Gly | Val | Gln | Ser | Ser | Gly | Val | Leu | Phe | Gly | Tyr | Trp | Leu | Leu | Cys | Phe |
|     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Val | Leu | Pro | Ala | Thr | Asn | Ala | Ala | Gln | Gln | Ala | Ser | Gly | Ala | Gly | Phe |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Gln | Ser | Asp | Pro | Val | Arg | His | Leu | Ser | Thr | Tyr | Leu | Cys | Leu | Ser | Leu |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Val | Val | Ala | Gln | Phe | Val | Leu | Ser | Cys | Leu | Ala | Asp | Gln | Pro | Pro | Phe |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Pro | Glu | Asp | Pro | Gln | Gln | Ser | Asn | Pro | Cys | Pro | Glu | Thr | Gly | Ala |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Ala | Phe | Pro | Ser | Lys | Ala | Thr | Phe | Trp | Trp | Val | Ser | Gly | Leu | Val | Trp |
|     |     | 210 |     |     |     | 215 |     |     |     |     |     | 220 |     |     |     |
| Arg | Gly | Tyr | Arg | Arg | Pro | Leu | Arg | Pro | Lys | Asp | Leu | Trp | Ser | Leu | Gly |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Arg | Glu | Asn | Ser | Ser | Glu | Glu | Leu | Val | Ser | Arg | Leu | Glu | Lys | Glu | Trp |
|     |     |     | 245 |     |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Met | Arg | Asn | Arg | Ser | Ala | Ala | Arg | Arg | His | Asn | Lys | Ala | Ile | Ala | Phe |
|     |     | 260 |     |     |     |     | 265 |     |     |     |     |     | 270 |     |     |
| Lys | Arg | Lys | Gly | Gly | Ser | Gly | Met | Lys | Ala | Pro | Glu | Thr | Glu | Pro | Phe |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Leu | Arg | Gln | Glu | Gly | Ser | Gln | Trp | Arg | Pro | Leu | Leu | Lys | Ala | Ile | Trp |
|     |     | 290 |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |

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Gln Val Phe His Ser Thr Phe Leu Leu Gly Thr Leu Ser Leu Ile Ile  
 305 310 315 320  
 Ser Asp Val Phe Arg Phe Thr Val Pro Lys Leu Leu Ser Leu Phe Leu  
 325 330 335  
 Glu Phe Ile Gly Asp Pro Lys Pro Pro Ala Trp Lys Gly Tyr Leu Leu  
 340 345 350  
 Ala Val Leu Met Phe Leu Ser Ala Cys Leu Gln Thr Leu Phe Glu Gln  
 355 360 365  
 Gln Asn Met Tyr Arg Leu Lys Val Pro Gln Met Arg Leu Arg Ser Ala  
 370 375 380  
 Ile Thr Gly Leu Val Tyr Arg Lys Val Leu Ala Leu Ser Ser Gly Ser  
 385 390 395 400  
 Arg Lys Ala Ser Ala Val Gly Asp Val Val Asn Leu Val Ser Val Asp  
 405 410 415  
 Val Gln Arg Leu Thr Glu Ser Val Leu Tyr Leu Asn Gly Leu Trp Leu  
 420 425 430  
 Pro Leu Val Trp Ile Val Val Cys Phe Val Tyr Leu Trp Gln Leu Leu  
 435 440 445  
 Gly Pro Ser Ala Leu Thr Ala Ile Ala Val Phe Leu Ser Leu Leu Pro  
 450 455 460  
 Leu Asn Phe Phe Ile Ser Lys Lys Arg Asn His His Gln Glu Glu Gln  
 465 470 475 480  
 Met Arg Gln Lys Asp Ser Arg Ala Arg Leu Thr Ser Ser Ile Leu Arg  
 485 490 495  
 Asn Ser Lys Thr Ile Lys Phe His Gly Trp Glu Gly Ala Phe Leu Asp  
 500 505 510  
 Arg Val Leu Gly Ile Arg Gly Gln Glu Leu Gly Ala Leu Arg Thr Ser  
 515 520 525  
 Gly Leu Leu Phe Ser Val Ser Leu Val Ser Phe Gln Val Ser Thr Phe  
 530 535 540  
 Leu Val Ala Leu Val Val Phe Ala Val His Thr Leu Val Ala Glu Asn  
 545 550 555 560  
 Ala Met Asn Ala Glu Lys Ala Phe Val Thr Leu Thr Val Leu Asn Ile  
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 Leu Asn Lys Ala Gln Ala Phe Leu Pro Phe Ser Ile His Ser Leu Val  
 580 585 590  
 Gln Ala Arg Val Ser Phe Asp Arg Leu Val Thr Phe Leu Cys Leu Glu  
 595 600 605  
 Glu Val Asp Pro Gly Val Val Asp Ser Ser Ser Ser Gly Ser Ala Ala  
 610 615 620  
 Gly Lys Asp Cys Ile Thr Ile His Ser Ala Thr Phe Ala Trp Ser Gln  
 625 630 635 640  
 Glu Ser Pro Pro Cys Leu His Arg Ile Asn Leu Thr Val Pro Gln Gly  
 645 650 655  
 Cys Leu Leu Ala Val Val Gly Pro Val Gly Ala Gly Lys Ser Ser Leu  
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 Leu Ser Ala Leu Leu Gly Glu Leu Ser Lys Val Glu Gly Phe Val Ser  
 675 680 685  
 Ile Glu Gly Ala Val Ala Tyr Val Pro Gln Glu Ala Trp Val Gln Asn  
 690 695 700  
 Thr Ser Val Val Glu Asn Val Cys Phe Gly Gln Glu Leu Asp Pro Pro  
 705 710 715 720  
 Trp Leu Glu Arg Val Leu Glu Ala Cys Ala Leu Gln Pro Asp Val Asp  
 725 730 735  
 Ser Phe Pro Glu Gly Ile His Thr Ser Ile Gly Glu Gln Gly Met Asn  
 740 745 750  
 Leu Ser Gly Gly Gln Lys Gln Arg Leu Ser Leu Ala Arg Ala Val Tyr  
 755 760 765  
 Arg Lys Ala Ala Val Tyr Leu Leu Asp Asp Pro Leu Ala Ala Leu Asp  
 770 775 780  
 Ala His Val Gly Gln His Val Phe Asn Gln Val Ile Gly Pro Gly Gly  
 785 790 795 800  
 Leu Leu Gln Gly Thr Thr Arg Ile Leu Val Thr His Ala Leu His Ile  
 805 810 815  
 Leu Pro Gln Ala Asp Trp Ile Ile Val Leu Ala Asn Gly Ala Ile Ala  
 820 825 830



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Glu Met Gly Ser Tyr Gln Glu Leu Leu Gln Arg Lys Gly Ala Leu Val  
 835 840 845  
 Cys Leu Leu Asp Gln Ala Arg Gln Pro Gly Asp Arg Gly Glu Gly Glu  
 850 855 860  
 Thr Glu Pro Gly Thr Ser Thr Lys Asp Pro Arg Gly Thr Ser Ala Gly  
 865 870 875 880  
 Arg Arg Pro Glu Leu Arg Arg Glu Arg Ser Ile Lys Ser Val Pro Glu  
 885 890 895  
 Lys Asp Arg Thr Thr Ser Glu Ala Gln Thr Glu Val Pro Leu Asp Asp  
 900 905 910  
 Pro Asp Arg Ala Gly Trp Pro Ala Gly Lys Asp Ser Ile Gln Tyr Gly  
 915 920 925  
 Arg Val Lys Ala Thr Val His Leu Ala Tyr Leu Arg Ala Val Gly Thr  
 930 935 940  
 Pro Leu Cys Leu Tyr Ala Leu Phe Leu Phe Leu Cys Gln Gln Val Ala  
 945 950 955 960  
 Ser Phe Cys Arg Gly Tyr Trp Leu Ser Leu Trp Ala Asp Asp Pro Ala  
 965 970 975  
 Val Gly Gly Gln Gln Thr Gln Ala Ala Leu Arg Gly Gly Ile Phe Gly  
 980 985 990  
 Leu Leu Gly Cys Leu Gln Ala Ile Gly Leu Phe Ala Ser Met Ala Ala  
 995 1000 1005  
 Val Leu Leu Gly Gly Ala Arg Ala Ser Arg Leu Leu Phe Gln Arg Leu  
 1010 1015 1020  
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 1045 1050 1055  
 Val Asp Ile Pro Asp Lys Leu Arg Ser Leu Leu Met Tyr Ala Phe Gly  
 1060 1065 1070  
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 Val Ala Ile Leu Pro Leu Phe Leu Leu Tyr Ala Gly Phe Gln Ser Leu  
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 Tyr Val Val Ser Ser Cys Gln Leu Arg Arg Leu Glu Ser Ala Ser Tyr  
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 1125 1130 1135  
 Val Arg Ala Phe Arg Thr Gln Ala Pro Phe Val Ala Gln Asn Asn Ala  
 1140 1145 1150  
 Arg Val Asp Glu Ser Gln Arg Ile Ser Phe Pro Arg Leu Val Ala Asp  
 1155 1160 1165  
 Arg Trp Leu Ala Ala Asn Val Glu Leu Leu Gly Asn Gly Leu Val Phe  
 1170 1175 1180  
 Ala Ala Ala Thr Cys Ala Val Leu Ser Lys Ala His Leu Ser Ala Gly  
 1185 1190 1195 1200  
 Leu Val Gly Phe Ser Val Ser Ala Ala Leu Gln Val Thr Gln Ala Leu  
 1205 1210 1215  
 Gln Trp Val Val Arg Asn Trp Thr Asp Leu Glu Asn Ser Ile Val Ser  
 1220 1225 1230  
 Val Glu Arg Met Gln Asp Tyr Ala Trp Thr Pro Lys Glu Ala Pro Trp  
 1235 1240 1245  
 Arg Leu Pro Thr Cys Ala Ala Gln Pro Pro Trp Pro Gln Gly Gly Gln  
 1250 1255 1260  
 Ile Glu Phe Arg Asp Phe Gly Leu Arg Tyr Arg Pro Glu Leu Pro Leu  
 1265 1270 1275 1280  
 Ala Val Gln Gly Val Ser Leu Lys Ile His Ala Gly Glu Lys Val Gly  
 1285 1290 1295  
 Ile Val Gly Arg Thr Gly Ala Gly Lys Ser Ser Leu Ala Ser Gly Leu  
 1300 1305 1310  
 Leu Arg Leu Gln Glu Ala Ala Glu Gly Gly Ile Trp Ile Asp Gly Val  
 1315 1320 1325  
 Pro Ile Ala His Val Gly Leu His Thr Leu Arg Ser Arg Ile Ser Ile  
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